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Lezha Energy and Ecological Corridor (LEEC). Climate Resilience through Blue and Green Corridors in Lezha Municipality

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Abstract- *This research paper builds on the analytical work conducted by the Doctoral Candidate, initiated on November 2021, during the International PhD Workshop between Polis and Ferrara Universities as well as based on his previous experience with Renewable Energy projects and Evaluation of Ecosystem Services conducted by the candidate under the "Green Lungs for Our Cities" project (link), supported by the EU Delegation in Albania. Given the climate and ecological disturbed balance in urban areas, future planning exercises shall be oriented towards climate neutral and decarbonized cities. Urban and territorial strategies nowadays seek to explore and determine the appropriate instruments for that Nature Based Solutions NBS and Ecosystem Based Solution EBS are enabled to decrease the deterioration of human impact on all the ecological networks.*

Moreover the Sofia Declaration (Regional Cooperation Council, 2020), an instrument that factorizes the EU Green Deal for Western Balkans indicates precisely that one of 5 key development sectors should be Biodiversity preservation and joint management.

Ecological networks including here the hydrology, green areas, geography, climatic conditions, energy metabolisms, transport infrastructure and industrial interactions can coexist in harmony if they are extracted from the ideology of approaching them as separate networks within a linear approach. One can always affect the other therefore "Between them there is no contradiction, but only profound opposition: to be resolved projectually" (Dardi, 2009).

Main objective of this research is to initially seek and determine an adequate relationship between ecosystem services provided by Green, Blue and Natural networks within the urban areas of Koder Marlekaj, Lezhe-Shengjin axis to further connecting them throughout a potential Ecological Corridor that would allow the terrestrial biodiversity of Kune-Vain-Tale protected area access high territory in cases of wildfire, flooding or other extreme-climatic events.

Such intervention will pose a new systemic approach towards problems and issues, which are caused mainly by a rigid and linear approach from nowadays Urban Planning and Decision-making practices at a local and national level. The purpose of this research paper is threefold: (i) to verify the biodiversity preservation potential of a new ecological corridor between high-land and lagoon,

(ii) in terlink the mix of urban-energy-ecology nexus within a specific case study whereas new urban planning tools,

(iii) propose relevant measures to increase the resilience of the Lezha-Shengjin territory with regard to Climate Change implications.

Key-Words: Ecosystem Service, Ecological Network, Climate Resilience, Renewable Energy, Biodiversity.

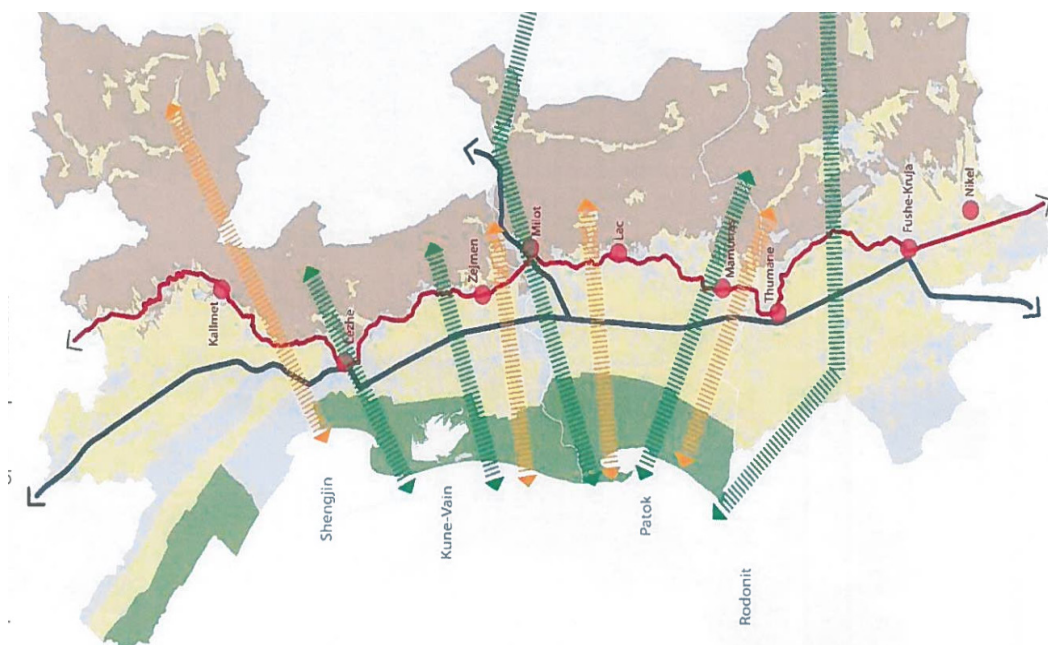


Fig. 1/ Strategic vision of green corridors in Lezha, Source/ Lezha Municipality

Introduction-The Municipality of Lezha is located in the western plain of the Republic of Albania, in an area of 508.9 km², bordered on the north by the Municipalities of Vau i Dejës and Puka, on the west by the Adriatic Sea and the Municipality of Shkodra, on the east by the Municipality of Mirdita and on the south by the Municipality of Kurbin. The municipality consists of 10 administrative units: Lezha, Shëngjin, Zejmen, Shënkoll, Balldren, Kallmet, Blinisht, Dajç, Ungrej and Kolsh. (National Agency of Urban Planning, 2017)

The territory contains two main urban areas (the city of Lezha and Shëngjin) and 65 villages. The total population of the municipality, according to the Civil Registry (2017) is 106,245 inhabitants, with an average population density of 209 inhabitants / km². This data positions the municipality among the 10 most populated municipalities in the country.

Lezha has a very favourable and strategic position, located in short distance to some of the main cities, such as Tirana (55km), Podgorica (98 km), Shkodra (44 km). Also, the municipality is located close to the main national infrastructure nodes, such as the Port of Durrës (70 km) and Rinas Airport (40 km), while the Port of Shëngjin is part of the municipality.

In regards to the terrain features, the Municipality of Lezha, for the most part has a plain relief, where the western part consists of sandy beaches and the wetland area of Kune-Vain-Tale (Protected

Landscape). In the eastern part, the terrain has a gradual increase in height and adopts mountainous hilly features. The natural landscapes are diverse and, in some areas, the terrain is below sea level. Its highest point is 'Maja e Velës' (Administrative Unit of Kolsh) with an altitude of 1170m, while the average height of most of the territory is 5 meters above sea level.

This geomorphological variation poses a challenge to the municipality in managing various natural hazards. The territory of the municipality has a very rich hydrography. The north-western part is traversed by a stream-line of the Drin River and Gjadri River, while in the south, the municipality is bordered by Mati River and its delta. Occasionally these rivers, as well as the entirety of the hilly-mountain streams, pose a threat of flooding, with significant consequences for agricultural land.

The Municipality of Lezha is recognized for its long coastline, which starts from the protected nature reserves of the Mati Coast and Kune-Vain-Tale to the rocky beaches in the north of the settlement of Shëngjin with an overall estimated surface of 4290ha. The coast of Shëngjin, during the last 25 years has undergone a high-density development, non-consistent with surrounding natural features.

Nevertheless, a large part of the coastline belonging to this municipality has not yet undergone any development, and there are still virgin beaches, which need to be protected and properly managed since during the last 3 decades they have

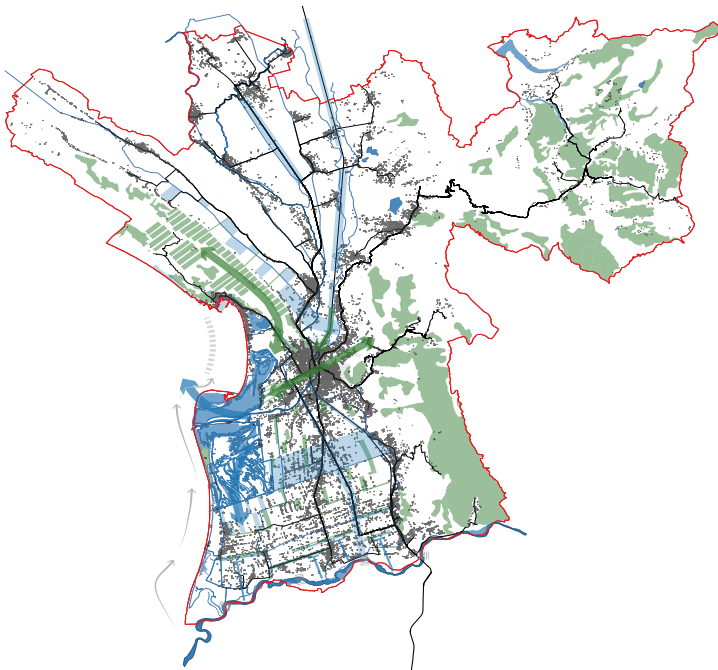


Fig. 2/ Proposed scenarios in the Shengjin-Lezha segment, Source/ <https://www.openstreetmap.org>.

been subject of a diverse and aggressive fragmenting intervention for economic, infrastructure, tourism purposes. (Co-PLAN Institute for Habitat Development, 2020). According to latest monitoring conducted by Nature Science Museum experts there are at least 11 mammal species nesting within the protected areas out of which, 7 are considered to be part of the highly endangered for extinction. (UTS-01 VSM Lezha, 2017).

More in specific we can point out that the following species are highly endangered (Natural Science University, 2006):

- Turtles,

Sea Turtle, Sea Leather Turtle (*Dermodochelys coriacea*) and Lagoon Turtle (*Emys Orbicularis*),

- Serpents,

Thin Arrow Serpent (*Coluber Najadum*), Small Arrow (*Coluber Gemonesis*)

-Mammals

Jackal (*Canis Aureus*), Otter (*Lutra lutra*), Baldosa (*Meles meles*), European Polecat (*Mustela putorius*), Wild Boar (*Sus scorfa*)

Ecosystem Based Approach and Nature Based Solutions Concept:

Integrating, Energy, Industrial, Green and Blue Networks within peri-urban areas as part of planning practice it is in the benefit of achieving a sustainable solution for the next generation of urban planners, academic discussion and the processes implemented during planning and developing strategies. Given the climate and ecological disturbed balance in urban areas, future planning exercises shall be oriented towards climate neutral

and decarbonized cities.

Natural, periurban and territorial strategies nowadays seek to explore and determine the appropriate instruments for that Nature Based Solutions NBS and Ecosystem Based Solution EBS are enabled to decrease the deterioration of human impact on all the ecological networks (IUCN, 2019). Climate change and land use/land cover change (LULCC) are associated with local vulnerability, defined as the intrinsic tendency of a system to be negatively affected by an event or phenomenon, but this can be ameliorated by ecosystem conservation (Laura-Gomez-Aiza, 2017).

The sixth assessment report of the intergovernmental panel on climate changes indicates that there will be an increase in hydrological and agricultural and ecological droughts (medium confidence), projected increase in aridity and fire weather conditions at global warming of 2°C and above (high confidence). Moreover a projected combination of climatic impact-driver changes (warming, temperature extremes, increase in droughts and aridity, precipitation decrease, increase in fire weather, mean and extreme sea levels, snow cover decrease, and wind speed decrease) by mid-century and at global warming of at least 2°C and above (high confidence). (United Nations, 2020)

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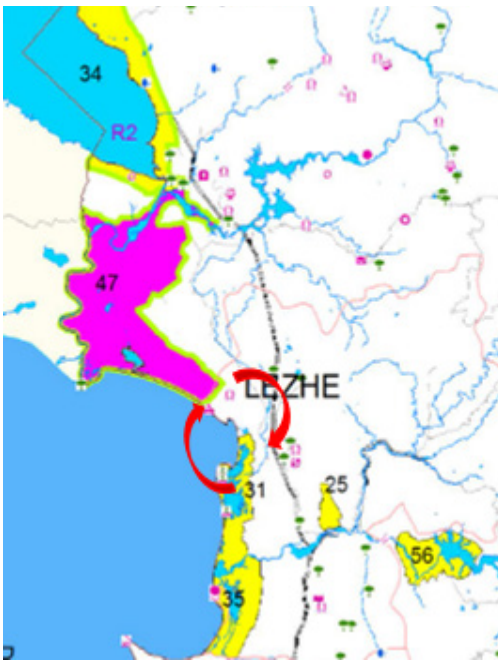


Fig.3 / Network of protected areas in North West Albania.

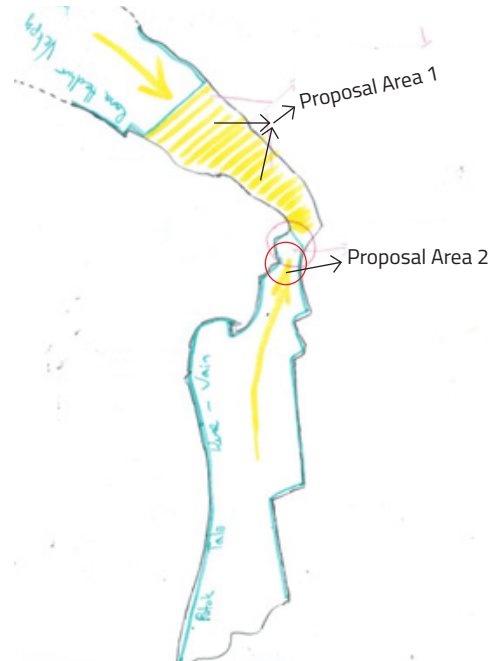


Fig.4 / Proposed ecological corridor for Lezha

approaching them as separate networks within a linear approach. One can always affect the other therefore “Between them there is no contradiction, but only profound opposition: to be resolved projectually” (Dardi, 2009)

Lezha Environment and Climate Status.

The Municipality of Lezha inherits an incomparably rich natural environment characterized by: diversity of terrain features and microclimate conditions; edaphic factors that have created various forest formations; considerable plain areas; vast wetland areas accompanied by lithographs and sandy beaches; geological formations abundant in minerals and groundwater; as well as a rich hydrographic network. The Municipality of Lezha has a number of protected areas of national and international importance.

The Kune-Vain-Tale Nature Reserve is a tremendous potential for the area. Another protected natural area is that of Bërzana, which is also classified as a Natural Reserve. After the 1990s a series of actions were undertaken to demolish and deactivate some of the industrial facilities, such as the former Paper Factory, which was a growing cause of pollution.

These actions had a positive impact on reducing industrial pollution. However, a number of other phenomena increased the pressure on the natural environment, leading to its degradation in some cases.

Some of these artificially induced phenomena are:

- the increase in the use of limestone and gravel from the Mat riverbed;
- overexploitation of groundwater and especially of the aquifer of the Mati Coast area;
- reduction of Drin e Mat River flows from cascade interventions; the use of forests and consequently the
- increase of erosion as a whole, especially coastal erosion;
- an increased traffic from motorized transport, and informal constructions in protected areas.

In particular, the coastal area below sea level is experiencing major effects from climate change, such as high-tide marine storms, flooding by rivers and seawater, prolonged droughts, heat waves, strong winds, etc. The coast of the Municipality of Lezha for decades has been facing a very aggressive erosion caused by the drastic reduction of solid sediments of the Drin River, as well as by the increase in the frequency and strength of marine storms that hit the coast. Studies confirm that the area is quite exposed to extreme climatic events, such as sea storms, accompanied by tides above the perennial average, intense flooding or prolonged droughts, which are becoming quite frequent. The coastal erosion activity in Kune-Vain has destroyed significant beach area and contributed to the elimination or destabilization of dunes and river banks.

Hypothesis on Integrating Nature Based Solutions at a large scale for Lezha Coastal Area.

Main objective of this technical proposal

consists above all to address an emergent need for that terrestrial biodiversity nesting or hosted within Kune-Vain and Tale Protected areas have a larger access especially in high altitude territories in cases of flood and or forest fire.

Given the actual situation whereas these Nature Protected Areas are almost bordered with urbanization, infrastructure and industry there are very few possibilities to conserve an optimal corridor that would serve as natural path for biodiversity forced movement due to climate related events.

Practically this intervention would solve and address to some extent the issue of biodiversity being trapped by the urbanization-infrastructure "fencing" their habitat.

Simultaneously given that for the northern coastline of Adriatic in Albania there is a "gap" that fragments the linear connection between Kune-Vain with Velipoja-Buna Delta as protected Areas.

The proposed corridor stretches from Kenalla Lagoon south up to Viluni Lake in the north. It stretches along a 17km hill with a low-density vegetation, mostly shrubs and with an average altitude of 300meters above sea level.

Such topographic conditions offer by default a optimal territory for Ecosystem Based Approach Interventions and specific Nature Based Solutions. Moreover, this is a territory of 40km² whereas the proposed interventions have a great potential not only on addressing an Climate related risk but also providing a sustainable approach on how we project co-existence with nature and habitats.

This area, alternatively known also as Marlekaj Hill should be projected as an Ecological Corridor that addresses the following needs:

- a. Connects the Wetland and Lagoon with Marlekaj Hill
- b. Offers a biodiversity safe passage
- c. Connects Rana e Hedhun with Protected areas in South and North
- d. Increase Ecosystem Services through forestation
- e. Implement Environment Friendly Infrastructure (Transport, Accommodation, Energy)

More in specific these proposals are divided in two key areas of interventions. First on Marlekaj Hill the proposals are:

- a. Road Infrastructure
- b. Energy Park

c. Forestation

d. 3xEco-Bridges

Second intervention is a limited area indicated as a Connection NOD between Kune Vain and Marlekaj Hill, whereas the specific proposals for this area consist on:

a. Encapsulation of Existing High Risk Infrastructure (the Fuel Tanks)

b. 1xEco-Bridge

c. Buffer area (exclusive only for habitat and biodiversity)

As a conclusion these potential interventions bear a rationale that attempts to address Albania commitments to EU Green Deal as a participatory and signatory partner of Sofia Agreement. Hence, such corridor shall not only ensure a biodiversity safe passage but rather boost further more the repopulation and rejuvenation of biodiversity.

A simple and rather natural road infrastructure should be constructed on what is presumed less than 25km road network. The road should be positioned on top of the hill and foresee first three big eco-bridges whereas terrestrial biodiversity could easily move from one side to the other and second a 130m buffer from both sides whereas such area shall be designated for the energy park, wind and solar.

Given the preliminary estimations, such installations can reach a maximum installed capacity of 150MWp with an average annual production of 322GWh of electricity, supplying thus more than 37000 families with electricity on a yearly basis.

Given the low density and presence of vegetation in the area, we propose that a total surface of 22km² is forested with roughly 2 million pine trees. The proposed species is Pinus Pinaster. It is envisaged that on a 20-year period of time this now grown forest can provide the following Ecosystem Services:

- a. Pollution and CO₂ natural storage estimated at 15'200 ton/year
- b. Oxygen production estimated at 408'00 ton/year
- d. Biomass fuel estimated at 7'000'000 liter/year
- c. Avoided runoff estimated at 600'000 m³

These ecosystem services consist on 15 million \$ economic input as per the above quantitative estimations.

For that the planted forest grows healthy and offers the above mentioned ecosystem services it is strongly required that all the inhabitants of this area are foreseen as direct safe-guards and

maintenance operators of this common pool resource.

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